REMARKS

This application has been carefully reviewed in light of the Office Action dated January 28, 2003 (Paper No. 10). Claims 1 to 67 are currently in the application, with Claims 1 to 9, 25 to 29, 48 to 50, 53, 57 to 59 and 62 having been withdrawn from consideration. Claims 10, 12, 20, 30, 35, 46 51, 52, 54 to 56, 60, 61 and 63 to 65 are the independent claims under consideration. Reconsideration and further examination are respectfully requested.

Applicants thank the Examiner for the indication that Claims 30 to 34, 54 and 63 are allowable. Applicants note however that Claims 54 and 63 are not included in the list of allowed claims on the Office Action Summary. Accordingly, Applicants request confirmation of which claims in the application are allowable. Applicants also thank the Examiner for the indication that Claims 36 to 38 and 44 contain allowable subject and would be allowable if rewritten in independent form. Applicants have not rewritten Claims 36 to 38 and 44 in independent form, however, since it is believed that all claims currently under consideration are in condition for allowance and discussed in more detail below.

Claims 10, 11, 15, 18, 35, 39, 51, 55, 60 and 64 were rejected under 35 U.S.C. § 102(b) over N. Ikonomakis, et al. "Region Growing And Region Merging Image Segmentation" (Ikonomakis); Claim 19 was rejected under § 103(a) over Ikonomakis in view of Y.S. Lim & K.H. Park, "Image Segmentation And Approximation Through Surface Type Labelling And Region Merging" (Lim); and Claims 12 to 14, 16, 17, 20 to 24, 40 to 43, 46, 47, 52, 56, 61 and 65 were rejected under § 103(a) over Ikonomakis in view of Rolf Adams & Leanne Bischof, "Seeded Region Growing" (Adams). Applicants

have considered the Examiner's comments together with the applied references and respectfully submit that the claims under consideration are patentably distinguishable over the applied references for at least the following reasons.

Independent Claims 10, 51 and 60 concern segmenting an image that is comprised of a plurality of pixels. According to the invention, one or more pixels are allocated as seeds and the image is segmented into regions by growing regions from the seeds. A subset of pixels that border the regions is considered and the pixel of the subset that is most similar in a property to a region it borders is appended to that region. The property of the region that includes the appended pixel is then updated.

The applied references are not understood to disclose the foregoing features of the present invention. In particular, the applied references are not understood to disclose at least the features of considering a subset of pixels that border regions in the image and updating a property of the region to which a pixel is appended.

Ikonomakis concerns a method for partitioning an image into different homogenous or similar regions. To form the regions, Ikonomakis is understood to compare a seed pixel with neighboring pixels to determine those pixels that have similar properties as the seed pixels, where those pixels having similar properties are appended to the seed pixel. However, Ikonomakis is not understood to compare the seed pixel with a subset of the neighboring pixels. Rather, as discussed on page 299, column 2, Ikonomakis is understood to compare all eight of the neighboring pixels with the seed pixel to determine which ones are similar. Therefore, Ikonomakis is not understood to disclose the feature of considering a subset of pixels that border regions in the image.

Ikonomakis is also not understood to disclose the feature of updating the property of a region to which a pixel is appended. Instead, as further discussed on page 299, column 2, of Ikonomakis, the value of a neighboring pixel that is appended to a region is changed to that of the seed pixel.

Adams, which was applied in the rejection of certain other claims, is not understood to disclose or suggest anything to remedy the foregoing deficiencies of Ikonomakis. Adams is understood to concern the segmentation of intensity images using seeds that are input either manually or automatically. Like Ikonomakis, Adams is understood to disclose comparing all of the boundary pixels to a particular pixel when determining which pixels to append to particular region. Therefore, Adams is not understood to disclose the feature of considering a subset of pixels that border regions in the image. Furthermore, Adams is not understood to disclose the feature of updating the property of the region to which a pixel is appended.

Lim, which was applied in the rejection of Claim 19 is not understood to disclose or suggest anything to remedy the foregoing deficiencies of Ikonomakis and Adams. Specifically, Lim is not understood to disclose the features of considering a subset of pixels that border regions in the image and updating a property of the region to which a pixel is appended.

Accordingly, independent Claims 10, 51 and 60 are believed to be allowable over the applied references. Reconsideration and withdrawal of the § 102(b) rejection of Claims 10, 51 and 60 are respectfully requested.

Independent Claims 35, 55 and 64 concern segmenting an image comprising a plurality of pixels. Seeds are distributed in areas of the image as a function of a property of the pixels within those areas, where fewer seeds are allocated to those areas of the image having pixels homogenous in the property. Regions are grown from the seeds so as to segment the image into a number of regions. To grow the regions, a subset of pixels that border the regions are considered and the pixel of the subset that is most similar in the property to a region it borders is appended to that region. The property of the region that includes the appended pixel is then updated.

The applied references are not understood to disclose the foregoing features of the present invention. In particular, the applied references are not understood to disclose at least the features of distributing seeds in areas of an image as a function of a property of the pixels within in those areas, considering a subset of pixels that border regions in the image and updating a property of the region to which a pixel is appended.

As discussed above with respect to Claims 10, 51 and 60, the applied references, namely Ikonomakis, Adams and Lim, are not understood to disclose the features of considering a subset of pixels that border regions in the image and updating a property of the region to which a pixel is appended.

With respect to distributing seeds within an image, the Office Action contended that Ikonomakis allocates pixels as seeds in areas as a function of luminance of the pixels within those areas. Applicants respectfully disagree and submit that the allocation of seeds in Ikonomakis is simply a function of what the next unassigned pixel in the image is following a predefined pattern for traversing the pixels. Nowhere is

Ikonomakis understood to disclose assigning the next pixel as a seed based on the luminance of pixels in that area.

Adams and Lim are not understood to remedy the foregoing deficiencies of Ikonomakis. Specifically, neither Adams nor Lim is understood to disclose the feature of distributing seeds in areas of an image as a function of a property of the pixels within in those areas.

Accordingly, independent Claims 35, 55 and 64 are believed to be allowable over the applied references. Reconsideration and withdrawal of the § 102(b) rejection of Claims 35, 55 and 64 are respectfully requested.

Independent Claims 12, 52 and 61 concern segmenting an image comprising a plurality of pixels into regions. One or more pixels are allocated as seeds for the regions and a list of pixels that border the regions is generated. A subset of pixels in the list of pixels is scanned and a value for each scanned pixel is determined, where the value is indicative of the similarity of a property of the scanned pixel and the corresponding property of a region that the scanned pixel borders. A scanned pixel that is most similar in the property to the region that borders the scanned pixel is selected and appended to the region. The property of the region that includes the appended pixel is then updated.

The applied references are not understood to disclose or suggest the foregoing features of the present invention. In particular, the applied references are not understood to disclose or suggest at least the features of scanning a subset of pixels that border regions in an image.

As discussed above with respect to Claims 10, 51 and 60, none of the applied references are understood to disclose or suggest the feature of considering a subset of pixels that border regions in the image. Therefore, the applied references are not understood to disclose or suggest at least the feature of scanning a subset of pixels that border regions in an image.

Accordingly, independent Claims 12, 52 and 61 are believed to be allowable over the applied references. Reconsideration and withdrawal of the § 103(a) rejection of Claims 12, 52 and 61 are respectfully requested.

Independent Claim 20 concerns segmenting an image comprising a plurality of pixels. One or more pixels are allocated as seeds in the image and regions of pixels are grown from the seeds. To grow the regions of pixels, a list of pixels that border the regions is generated and a number of pixels of the list are scanned using a step size between scanned pixels that is a function of the length of the list. For each scanned pixel, a value indicative of the similarity of the luminance of the canned pixel and the corresponding luminance of a region that the scanned pixel borders is determined and pixel having a minimum value is selected. The selected pixel is appended to the region it borders and the corresponding luminance of the region that includes the appended pixel is updated.

Independent Claims 46, 56 and 65 concern segmenting an image comprising a plurality of pixels. Pixels are allocated as seeds in areas of the image as a function of luminance of the pixels within those areas, where fewer seeds are allocated to those areas of the image having pixels of homogenous luminance and where the seeds form growing regions. A list of pixels that border the growing regions is generated and a number of

pixels of the list are scanned using a step size between scanned pixels that is a function of the length of the list. For each scanned pixel, a value indicative of the similarity of the luminance of the scanned pixel and the corresponding luminance of a growing region that borders the scanned pixel is determined and a pixel that has a minimum value is selected. The selected pixel is appended to the growing region it borders and the corresponding luminance of the region that contains the appended pixel is updated.

The applied references are not understood to disclose or suggest the foregoing features of the present invention. In particular, the applied references are not understood to disclose or suggest at least the feature of scanning a number of pixels on a list of pixels that border regions of an image using a step size between scanned pixels that is a function of the length of the list.

As discussed above with respect to Claims 10, 51 and 60, the applied references are understood to compare each of the neighboring pixels with a seed to determine whether to append the neighboring pixel to a region. Accordingly, the applied reference are understood to compare all pixels that border a region and not limit the comparison to a number of pixels on a list using a step size between scanned pixels that is a function of the length of the list. Therefore, the applied references are not understood to disclose or suggest the feature of scanning a number of pixels on a list of pixels that border regions of an image using a step size between scanned pixels that is a function of the length of the list.

Accordingly, independent Claims 20, 46, 56 and 65 are believed to be allowable over the applied references. Reconsideration and withdrawal of the § 103(a) rejection of Claim 20 are respectfully requested.

The other claims under consideration are dependent from the independent claims discussed above and therefore are believed to be allowable over the applied references for at least the same reasons. Because each dependent claim is deemed to define an additional aspect of the invention, the individual consideration of each on its own merits is respectfully requested.

In view of the foregoing amendment and remarks, all claims currently under consideration are believed to be in condition for allowance and such action is respectfully requested at the Examiner's earliest convenience.

Applicants' undersigned attorney may be reached in our Costa Mesa, California, office by telephone at (714) 540-8700. All correspondence should be directed to our address given below.

Respectfully submitted,

Andrew D. Michaelson

Attorney for Applicants

Registration No. 50,957

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-2200
Facsimile: (212) 218-2200

CA_MAIN 62427 v 1